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# Networking Websites Usage: All Students Multitask, Do All Manage Cognitive Load? A Comparative Study

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# **NETWORKING WEBSITES USAGE: ALL STUDENTS MULTITASK, DO ALL MANAGE COGNITIVE LOAD? A COMPARATIVE STUDY**

*Research in Progress*

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## **Abstract**

*Social networking has been expanding widely for almost two decades. All students use social networking platforms and usage is more intense and complex to impact a whole era social life. Based on cognitive load theory and dual task approach, we measure the mediating effect of social networking sites usage on the impact of individuals' characteristics on their academic achievement. Research model proposed presumes that basic values, personality traits and social status have an effect on Facebook usage and cognitive absorption which in turn have an effect on academic results. Research looks at Facebook usage for recreation into multitasking context and assesses moderating role of polychronicity capacity. Group comparison is used to analyze countries and gender differences.*

*Keywords: Facebook usage, cognitive absorption, basic values, personality traits, social status, polychronicity, academic achievement.*

## 1 Introduction

For many years, there has been a widespread concern on students' performance. Many studies explored the impact of external aspects such as: students' socio-economic backgrounds (Tajalli and Opheim, 2004) and available opportunities (Boscardin et al., 2005). Others focused on the amount of effort shown by students in terms of their participation, discussion and interaction, either in class or during online sessions (Davies and Graff, 2005). Yet, others studies were concerned with educational methodologies such as the different methods used to assess students work, as well as the multiplicity of the information sources effect on students' performance (Greer, 2001; Funkhouser, 2003). All in all however, few studies looked at the impact of whether and how student's usage of the technology influences their achievement.

Based on cognitive load theory, past research focused on different ways information is presented to learners, bearing in mind the amount of distraction experienced by students as a result of being simultaneously attracted by different learning sources. In the present study we attempt to use the cognitive load theory to investigate the impact of the use of technology, outside the classroom, on students' performance. Special emphasis will be given to situations where, for example students are logged onto a social networking site while simultaneously doing their homework. Particular attention will be given to the usage of social media (SM) technologies and the cognitive load effect that these have on students. Such use is primarily being considered as a second task performed by students in order to have a better conditioning to improve their level of academic work.

A known fact is that many students spend most of their free time surfing the social websites. The advantages of this new social activity include a higher level of integration between teenagers and students, new friends are easy to find, as well as the continuous exchange of information and knowledge between students. On the other hand, unlimited exposure to these media is known to have an overall negative effect on students' performance. A browse through the pages of the more popular social networking sites will quickly reveal that many students constantly express their concern regarding their inability to concentrate on their academic work because they heavily distracted by these media.

This trend has been confirmed in a research study by Karpinski and Duberstein (2009), who concluded that in general, students using Facebook score lower grades than students who do not have access to such communities. While the former only spend an average of one to five hours a week to study at home, the average weekly study-time spent by non-users exceeds eleven hours. This situation can be attributed to an inappropriate direction of the students' attention which in turn leads to distraction, due to simultaneous multitask performance (Paas et al., 2003a; Paas et al. 2003b; DeLeeuw and Mayer, 2008).

On another hand, according to Karpinski and Duberstein, (2009), 79% of Facebook users (students) actually claim that spending time on social network sites does not interfere with their studies. Community members typically spend long hours interacting with each other, uploading videos and pictures, sharing web links, checking their inbox messages and sending their replies. Nevertheless, the number of active users of Facebook is steadily increasing, notwithstanding the adverse effects that this popular site may have on students' overall academic performance.

Indeed, educational authorities are rightfully concerned about how these media are affecting their students. On the other side, both parents and instructors need to understand the keen interest that students seem to develop for these technological wonders. Moreover, they should also learn how to react to this new trend. In this study, we question whether Facebook usage and cognitive absorption have negative effect on academic achievement on all students profiles combined?

The objectives of this research in progress paper would be to:

- Draw a research model that assesses the effect of Facebook usage on cognitive absorption and academic achievement and

- Develop the research hypotheses that account of the role of students personal characters in determining Facebook usage and cognitive absorption level.

## 2 Theoretical Background

Cognitive Load Theory (CLT), which aligns dual task approach, memory load, the distribution of the cognitive resources and split attention paradigm, is the underlying theory for this study.

### 2.1 Cognitive Load Theory (CLT)

As an instructional theory, CLT focuses on load generated by a dual tasks carried out in the same time and assumes that individuals' working memory can only process limited number of items at the same time. Research on cognitive load has been the object of many experimental and on site studies conducted with the aim to forecast best instructional context to stipulate students to have better achievements (Brünken et al., 2003), but also, CLT argues that individual working memory load may be affected diversely depending on the sources for cognitive load (Brünken et al., 2003). It can result from the inherent nature of the learning materials presented to the students, so called intrinsic cognitive load; the way the content is presented to the learners (extraneous cognitive load) or the quantity of cognitive resources people are willing to devote for the learning task, so called germane load.

Besides, Paas (1992) distinguishes two components for the cognitive load that are mental load and mental effort. In fact, mental load refers to the load induced by instructional parameters such as task structure and sequence of the information and the learner's interest to the subject. It makes a cohesive presentation of the intrinsic, extraneous and germane load. Mental effort, however, refers to the amount of capacity that is allocated to understand the learning materials and get knowledge out of it; it makes a slight difference with the germane cognitive load. While the germane load relates to the connection the learner is having or bearing on the subject taught, the mental effort relays more to the endeavor learners are willing to bring in in order to achieve the learning assignment.

### 2.2 The Dual task approach

On the dual task approach, Brünken et al., (2003) distinguish two different ways of use considering either a primary task approach or secondary task approach. Primary task approach supposes that a secondary task is added to a primary one to stimulate the memory load to perform the primary task. The variable of interest here is performance on primary task, which would decrease in reaction to a higher cognitive load. Memory and cognitive loads increased by a secondary task load would impact a decrease on the performance on the main task. Built on the same line of reasoning, the secondary task approach uses the second task to measure the memory load induced by the primary task on the secondary one. The variable of interest in this case is the performance on the secondary task (Brünken et al., 2003).

In the present study, we apply the primary task approach to measure the impact of a secondary task (Facebook usage) on the primary task (learning process). The working load grows up with a secondary task inversely stimulating the memory load on the main (primary) task. This fact induces a decrease of the student performance due to split attention on occupations, performing studying and surfing on the social website simultaneously. Focus is on keen interest of students to the networking site, intensity of its use and content drawn on during that time.

Further, we develop the research model to address the research objectives.

### 3 Research Model

#### 3.1 Antecedents to Facebook usage and cognitive absorption

##### 3.1.1 Personality traits

Personality has been brought to mind as for people's use of Facebook and its prediction to students' performance (Canales et al. 2009). Previous researches posit that personality has an important effect on students' results (Nofle and Robins, 2007; DeRaad and Schouwenburg, 1996; Digman and Take-moto-Chock, 1981). Distinct from a person's own intelligence, the personality influences students' academic performance (Nofle and Robins, 2007; Wagerman and Funder, 2007; Duckworth and Seligman, 2005). Several studies (Chamorro-Premuzic and Furnham, 2003; Rindermann and Neubauer, 2001; Blickle, 1996; Cacioppo et al., 1996; De Raad and Schouwenburg, 1996; Wolfe and Johnson, 1995; Goff and Ackerman, 1992) have been carried out with both college and universities students to analyse whether personality traits predict students' performance and achievements; controversial results have been concluded. While several earlier researches (Allik & Realo, 1997; Rothstein et al. 1994; Dollinger and Orf, 1991; Green et al. 1991; Mehta & Kumar, 1985) have concluded that personality doesn't significantly determine students' academic performance, more recent researches (Poropat, 2009; Tabak et al, 2009; Nofle and Robins, 2007; Conard, 2006; Chamorro-Premuzic and Furnham, 2003; Wolfe and Johnson, 1995) have argued that personality attributes are conclusive toward a better achievement in class. In fact, personality traits are associated to the ability of the person to do something, for instance to learn, and how the learner goes with the learning process. This stands for consistent evidence of the impact personality has on learners' results.

To this extent, where low agreeableness; high openness and high consciousness were initiated as predictors to achieve high scores; neuroticism, high agreeableness and extroversion pulled down the students' academic performance (Poropat, 2009; Tabak et al, 2009; Nofle and Robins, 2007; Conard, 2006; Chamorro-Premuzic and Furnham, 2003; Wolfe and Johnson, 1995). Indeed, Conard, (2006); Lounsbury et al. (2005) and Gray and Watson, (2002) studies have found that high level of **agreeableness** would favourably carry socialisation. People at this trait are straightforward, sympathetic and trustful (John and Srivastava 1999) which make easy for them to introduce themselves to new people they would meet on one website or the other. Their altruism, forgiving and tender-mindedness attitude facilitate their socialisation and they by far integrate social networks nowadays. Yet they might keep cautious attitude in terms of their interaction and content they provide on these websites.

**Extroversion** proves a quite similar attitude to agreeable people. However extroverts show more assertiveness, energy and excitement toward their surroundings. With their talkative character, outgoing stance and enthusiastic behaviour, they tend to be very sociable and adventurous than introverted but also agreeable people. Wiggins (1979), John and Srivastava (1999) and Judge et al. (2002) argue that extroverted people are dominant and effective in leading groups. Their agent character supports their success in this task. Extroverted people have self-confidence and are determinant and open which facilitate expressing their ideas, opinions and feelings more comfortably. Canales et al. (2009) identified that extroverted students have lower grades as a measure to their academic performance. Focus in the two studies is on how students are carrying out within their classes and difference in the conclusions can be explained by the level of attention given to the main task to perform. Extroverted students would be easily diverted from the main task of learning, being more attracted by an activity that absorbs their impulsiveness and excitement seeking. Moreover, Canales et al. (2009) study's outcome shows that extroverted (and neurotic) people are heavy users of Facebook suitably to their gregariousness and assertiveness. Thus, they would tend to be the owners of a big number of groups on this so-

cial network that lead discussions about many sorts of subjects that interest the audience of this community. Furthermore, as a deduction from Judge et al. (2007) and Canales et al. (2009) studies results, extroverted students tend to invest on time resources to spend more on social networking than studying. High mental effort is devoted to social activities such as group and instant discussions, video and pictures uploading and sharing which declines the mental effort allocated to the learning tasks.

Controversially, **conscientious** people as representation of directivity, self-discipline, organization and efficiency would better organize their involvement in more than one activity at once. Students with this specific character are deliberate and feel dutifulness, thus strive for achieving their objectives, for instance good academic results. Their sense of order, carefulness and competence make them methodical and scrupulous in their time management and the way they handle the tasks to perform. Students at this trait are more rigorous regarding their studies and feel responsible to accomplish expected results and can't tolerate to be careless. Being hardworking and persistent, conscientious students manage to achieve a high academic performance (Wolfe and Johnson, 1995, Judge and Ilies 2002, Baruchard 2003; Conard 2006, Tabak et al. 2009)

**Neuroticism** as a negative nature would have a negative impact on performance (Barrick et al. 2001, Tabak et al. 2009). The specific personality character is expresses an unconstructive and unproductive temperament. People who regularly feel anxious, worried, not self-confident and shy tend to be introverted and participate only in activities that go with their personalities. They are either performing activities on their own, or unenthusiastically impact a group work. They either do not or rarely participate in social activities. With their continuous feeling of irritation and depression, they are more likely to do not choose to integrate a social community. However, with their character of vulnerability due to lack of self-confidence, they might tend to join social networking in answer to their impulsive, moody character and propensity to achieve content impression.

While previous studies have shown that neurotic people tend to over use internet (Hardie and Tee 2007, Hamburger and Ben-Artzi 2000), with the consideration of the interaction character within the social websites, we presume that neurotic people would either have passive presence on these websites.

Preliminary results from Canales et al. (2009) show that neurotic people use of Facebook positively correlates with the time spent on this social website, but this doesn't tell more about the extent of use and whether they have been interacting with others on the social website or not.

Curious people or people who are **open** to experience are imaginative, have large set of interests and like to explore new ideas. However, this doesn't necessary imply that they have an outgoing attitude or are adventurous. In fact, they act in terms of interests and curiosity about new ideas, with excitation and fantasy to added value they can get out of this openness to experience. Though, people with this personality trait are unconventional and stick to their values.

Referring to these definitions and outcomes from prior research, we hypothesize that:

**H1a: Personality traits has an impact on Facebook usage and**

**H1b: Personality trait has an effect on cognitive absorption on Facebook.**

### **3.1.2 Basic values**

Largely discussed and used in political attitudes formation context, basic personal values refer to people's values and subjective beliefs (Schwartz, 1992). Schwartz (1992) categorizes personal basic val-

ues into four dimensions which illustrate what people assume in their lives: with openness to change people are sociable and outgoing. They are determined and easily adopt changes to achieve objectives they set. Self transcendent individuals make their individual perceived success out of help they would be able to provide to others and support they can bring for any one that needs assistance. Self enhanced people are people full of inner energy more often willing to be contagious to each individual in continuous social interaction with them. Yet, conservative individuals need rather security, so they stick to tradition and conformity to principles (Schwartz, 1992, 2006, 2010, 2014).

We hypothesize that:

**H2a: Personal basic values have an impact on Facebook usage and**

**H2b: Personal basic values have an impact on cognitive absorption.**

### 3.1.3 Social status

Social status refers to a person's social position considering its wealth, occupation and education level (Adler and Stewart, 2007). While Adler and Stewart (2007) identify two ways to measure social status, objective and subjective ways, both tools are complementary, so they do not present the individual's information redundantly. While objective social status is measured by a tier party recognition of the family and individual wealth, occupation and education level, subjective social status reports these indicators adding respective weight to what should be valued more among the three dimensions.

Adler and Stewart (2007) posit to use MacArthur ladder for individuals to position themselves in comparison to their respective population which is a self-reported ranking and measure. However, objective social status scale present quantified measures of one's financial status, job position and education level. In these conditions, social status would define individuals' access to internet and social networking platforms in terms of devices used, accessibility of the internet service 24hours a day and individual availability to go on social networking sites.

We presume these attributes to affect students' presence on the social networking platforms, its duration and cognitive immersion to determine level of control one has on its presence on the social networking site, how enjoyable this experience gets, the number and nature of activities performed and recognition of the experience associated to the time spent on the platform.

Thus, we hypothesize that:

**H3a: High social status would increase Facebook usage.**

**H3b: High social status would increase the cognitive absorption on Facebook.**

## 3.2 Facebook usage, cognitive absorption and students' achievements

Social Media (SM), social networks or social networking websites; expressions seem to have different meanings, but refer to a common concept, a precursor that conducted the worldwide into a change allowing individuals to communicate instantaneously via networks (Lariscy, et al. 2009). Previously, tools that are used for social exchange, such as: email, intranet, blogs, videoconferencing, podcast, video sharing, instant message, events, social networking, text messaging, photo sharing, wikis, virtual worlds, social bookmarking, gaming, micro-blogging (presence applications) and news aggregation have been also call SM (Erych et al., 2008). In this study, by SM we refer more specifically to social

networking websites and more specifically to Facebook. This system describes in itself the online practices that make use of technology and enable people to share content, opinions, experiences, insights, and technologies themselves. An illustration can be information shared via Twitter, videos shared on Youtube or Facebook or contacts and comments made on Facebook that point up the use of these new systems. Facebook as one of these social networks is today the top ranked in terms of use (Alexa Traffic Rank, 2010).

Karpinski and Duberstein's exploratory study (April 2009) posits that students spend from 3 to 4 hours a day on Internet and more than 5 hours per month surfing on Facebook. Statistics from the social media guide Mashable (October, 2009) show that people are spending about 5hours 39 minutes per month on Facebook. More recent study (November 2009) shows that Facebook surfers spend 3 full days per year on Facebook; which is equivalent to 6 hours per month. Statistics from the Facebook website itself (2010) points that 50% of their users that count over 400 millions, log on to the social website each day. Besides, debate wise from the International debate education association (IDEA) announces on February 2010 that facebookers spend 2.6 millions minutes (equivalent to about 43 334 hours) on the social network each day. This can be translated by an average time of 6 hours 30minutes per month per person. More recent statistics, (kissmetrics, 2015) show that average time spent on the social platform is 700min (11hours and 40mn per person per month). Wearesocial.com (2015) notes that average individual presence on Facebook is 4hours and 25min per day.

This is demonstrating a continuous increase of the usage of Facebook across the globe. Understanding how a computer, internet, (and more specifically Facebook use), can enhance or detract the students' achievements is the responsibility of both parents and teachers (Shields and Behrman, 2000) that need to understand this phenomenon. Furthermore, authorities are concerned and are wondering about the consequences to this extensive use for different groups of people. Besides, two recent studies (Karpinski and Duberstein, 2009 and Canales et al. 2009) have confirmed a negative impact of the time spent on this social network and their performance measured through their reported grade-point averages (GPAs). However, both studies have been run in US and focus was on the time spent on the social network, although Canales et al. (2009) spotlighted the role of the personality in determining the level of use of this social media.

As presented above, we presume that Facebook usage has a negative effect on students' achievements due to students' split attention on dual tasks. Students who are spending long hours a day surfing Facebook and exchanging with their friends online are taking time from their duties for the courses.

Furthermore, IT systems usage has been vastly discussed. This concept has had wide range of understandings and complex approaches (Venkatesh et al. 2008; Burton-Jones and Straub 2006; Jasperson et al. 2005; Straub et al. 1995). Technology use and Information system (IS) use has been the largest discussed approaches in the literature and business press. Reflections were mainly focused on information systems deployment and their success measurement through new technology use concept.

Venkatesh et al. (2008) highlight the importance of technology use itself but also the surrounding practices. Depending on the purpose of the system use measurement and the context of the system use itself, there are different approaches to represent the system use. Most common variables that apply to our context are: extend of student involvement in the use of this system, the duration of such use and the frequency.

In terms of cognitive absorption, Agarwal and Karahana (2000) have identified cognitive absorption as the construct that put together

Building upon this line of argument, we presume that:

#### **H4a: Usage of Facebook has a negative impact on students' achievements, and**



**H4b: Cognitive absorption has a negative impact on students' achievements.**

We hypothesize also that high cognitive absorption would increase Facebook usage. Thus we test the following hypothesis:

**H5: High cognitive absorption would increase Facebook usage.**

### **3.3 Moderating effect of polychronicity**

Polychronicity or multitasking has been widely discussed in previous researches mainly focused on time management in job performance (Hecht and Allen 2005; Kaufman-Scarborough and Lindquist, 1999; Slocumbe and Bluedorn, 1999; Lee, 1999). The concept has been largely introduced as a cultural characteristic that varies across the countries. It relates to the way people of one country or the other are used to manage their daily activities (Lee, 1999). While monochronicity is about performing one task at once and scheduling tasks to be run one after the other, polychronicity is essentially about pairing at least two tasks at once (Hecht and Allen 2005; Kaufman-Scarborough and Lindquist, 1999; Lee, 1999). Therefore, we presume polychronicity varies cross countries and set the following hypotheses that presume the moderating effect of polychronicity on the impact of Facebook usage on the students' achievement as well as its moderating effect on the impact of cognitive absorption on students' achievement. We check polychronicity capacity across three countries sample. Then, we test whether a student with higher polychronicity ability would be less vulnerable to the negative impact of Facebook usage on his academic performance.

Thus, we hypothesize that:

**H6a: Polychronicity level has a significant moderating effect on Facebook usage impact on students' achievement.**

**H6b: Polychronicity has a significant moderating effect on cognitive absorption impact on students' achievement.**

The research model below (Figure 1) depicts the interdependencies defined above. Further, we describe the empirical study to be run with students who use Facebook.

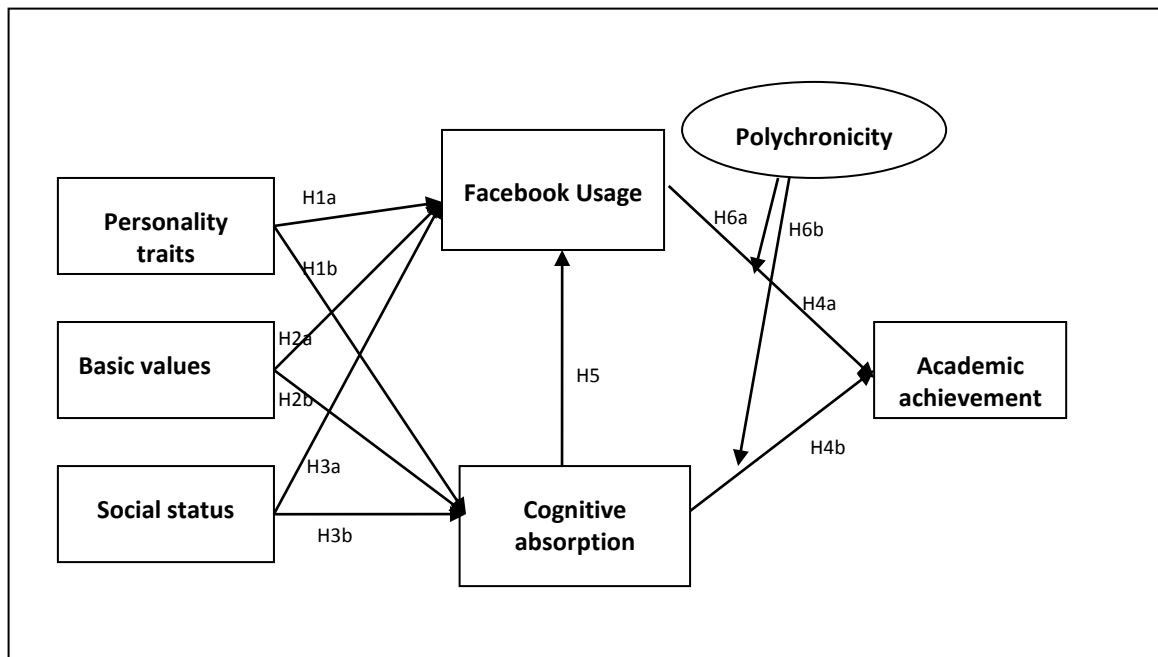


Figure 1. Research Model

## 4 Methodology

### 4.1 Data collection

A survey is being designed and will be sent to undergraduate business students from three schools of Management in three countries, France, Kingdom of Saudi Arabia and Tunisia.

### 4.2 Measures

Measures used in the survey are adapted from confirmed studies in social and educational sciences where prior researches have shown reliability and validity in their respective contexts.

Yet, some changes occurred on the measures' wording in order to adapt the scales to the context of our study. Changes have mainly concerned "Facebook usage" construct. Measures have been used from "the Information System usage" at the Information System (IS) discipline.

Examples from the measures used are presented in the table 1.

Constructs	Measures	Reference
Facebook usage	Time spent Frequency Extent (activities)	Burton-Jones and Straub (2006)
Cognitive absorption on the web	Temporal Dissociation Time appears to go by very quickly when I am using the Web, Focused Immersion While using the Web I am able to block out most other distractions. Heightened Enjoyment I have fun interacting with the Web. Control When using the Web I feel in control Curiosity Using the Web excites my curiosity	Agarwal and Karahanna (2000)
Personality traits	Extroversion I like to have a lot of people around me. Agreeableness I try to be courteous to everyone I meet. Conscientiousness I strive for excellence in everything I do. Neuroticism I often get angry at the way people treat me. Openness I have a lot of intellectual curiosity.	Costa and McCrae (1992)
Polychronicity	I do not like to do several activities at the same time I should not try to do many things at once	Kaufmann- Scarborough and Lindquist (1999)

Table 1: Measures examples

### 4.3 Data Analysis

Collected data will be analyzed using structural equation modeling statistical method and SmartPLS package to test measurement and structural models. Convergent and discriminant validities will be measured for each construct and evaluate the significance level of hypothesized causal effects.

### 4.4 Expected contributions

The research study is expected to make contribution at two main levels:

- Develop a research model that account of combined personal characters that explain Facebook usage and online cognitive absorption.
- We will assess satisfaction with life variance explained by the research model. We will also analyze condensed effect of personality, basic value and social status and quantify explained variance of Facebook usage and cognitive absorption by respective individuals' profiles.

## 5 Conclusion

Use of the social networks has been expanding very widely with the use of the social media such as MySpace, Youtube, Twitter or Facebook. Preliminary studies have analyzed the impact of personality traits on the use of these networks and its preliminary impact on the students' achievement. However,

little consideration has been given to the cognitive load induced by the pair run of both homework and interaction on the social websites. Lower reflection toward the impact of the mental effort the students devote to their studies was also stated. Taking into account these unexplored area to explain the real impact of the SM use on students' results, we presumed that simultaneous use of Facebook and homework preparation stimulates a high extraneous load that negatively impacts the working memory load. While a high cognitive load is experienced lower grades result.

The designed comparative study will allow comparing academic achievement for students with similar personal characters although in different cultural background settings, compare results from three countries two by two and assess to which extent Facebook usage and cognitive absorption are interdependent and would affect students' academic achievement while controlling the final results through the polychronicity capability level.

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